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BENCHMARKING: APPLICATION OF COMMERCIAL PRACTICES TO AIR FORCE PROCESSES

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Abstract

As a result of the Air Force's move to Two-Level Maintenance and a Lean Logistics environment, the Air Force transportation community must adapt current practices to meet new standards. In the past, Air Force transportation managers have relied on organic military airlift to move high priority international shipments. However, the reduced infrastructure, coupled with the move to Lean Logistics and Two-Level Maintenance, mandate an increasing reliance on commercial express transportation to meet critical mission requirements. Consequently, Air Force transportation managers are faced with determining which commercial carrier provides the best service to meet Air Force requirements to a particular international location. Currently, however, there is no Air Force guidance to help transportation managers make this carrier decision. This study will identify selection criteria important within commercial industry and identify commercial practices that can be benchmarked by the Air Force.

The objective of this study is to provide recommendations to the Air Staff that will improve Air Force transportation support of Two-Level Maintenance and Lean Logistics requirements. The extensive literature review explored academic literature, commercial processes, and DOD and Air Force Lean Logistics requirements. Next, using a benchmarking framework, we queried commercial industry, via a telephone inquiry, to identify the processes they use in selecting and evaluating international small express package carriers. From this information, carrier performance trends were identified and

analyzed. Finally, commercial industry's "best practices" were identified for possible adoption by the Air Force.

The study revealed several practices within commercial industry that could be adopted by the Air Force to improve the efficiency of moving high priority small packages to locations around the world. Several common trends in the selection and evaluation of transportation carriers surfaced during our analysis, and served as a basis for our recommendations. Our analysis identified the need for: (1) Contracts with multiple carriers, (2) detailed contracts with commercial transportation carriers, (3) detailed carrier-generated reports, (4) reimbursement for unsatisfactory service, (5) comprehensive routing guides, and (6) development of comprehensive guidance by a corporate logistics council.

The Air Force must look to the future and adjust its procedures for moving high priority small package international shipments to meet the requirements of Lean Logistic and Two-Level Maintenance. If we are to meet the needs of our customers in this arena, we can no longer rely on military airlift and the use of commercial transportation will prevail. Commercial industry is already employing many innovative practices, and we must follow their lead and amend current Air Force transportation policy to meet the demands of the changing logistics environment.

Chapter 1

General Overview and Introduction

The end of the Cold War brought significant changes for the Department of Defense (DOD) and, specifically, the DOD logistics system. In response to post Cold War changes, then Secretary of Defense Les Aspin initiated a Bottom-Up Review to evaluate the DOD force structure and requirements. The Bottom-Up Review validated the continued need for a strong defense—one manned, equipped and capable of fighting and winning two major regional contingencies whenever and wherever necessary to protect our national interests. It also recognized that while the DOD was "continuing to draw down the forces, cut infrastructure and reduce costs, the missions of the DOD are, in fact, expanding."[1]

No longer threatened by war with another superpower, the DOD faced the task of adjusting response requirements to regional conflicts, humanitarian support, peacekeeping missions and military operations other than war. This transition from a large scale global mobilization force to a flexible, rapid response force required new plans, new concepts and a new force structure. With these mission changes came force reductions—from 1.6 million active duty forces to 1.4 million.[2] At the same time, the Base Realignment and Closure commission (BRAC) was evaluating military installations for realignment and/or closure. As a direct result of the BRAC recommendations,

numerous installations were realigned and/or closed. The reductions in our physical infrastructure (bases), coupled with the "major reductions in forward deployed forces, significantly reduced the enroute infrastructure that support long-range deployments. Lack of enroute support facilities not only reduces rapid deployment capabilities, it also limits the options of the National Command Authorities during crises."[3]

The reduced infrastructure abroad, combined with diminishing defense budgets, forced DOD officials to search for new and innovative ways to support deployment requirements. "Doing more with less" became the accepted motto, and as a result of the new constraints, the Deputy Under Secretary of Defense (Logistics) directed a comprehensive examination of the DoD's infrastructure and capabilities. This review was designed to provide a framework for a plan that would improve logistics performance despite the reduced infrastructure. The resulting document—the DOD Logistics Strategic Plan—outlined goals, objectives and strategies to meet the challenges of the Post-Cold War force structure.

The DOD Logistics Strategic Plan outlined specific logistics goals and encouraged each service to incorporate the goals into their planning and management priorities. Significantly, the plan highlighted the requirements to streamline logistics processes, improve responsiveness to customers and develop seamless logistics systems to take advantage of current communications technology. Benchmarking successful business practices and adapting them for use in the DOD was a key strategy to achieving the goals and objectives outlined in the DOD Logistics Strategic Plan.

Within the Air Force logistics community, the increased emphasis on adopting business practices motivated Lt Gen Hammond, Air Force Director of Logistics, to

initiate research into "innovative organizational or process changes that might transform USAF logistics systems to meet future challenges."[4] In response, the Air Force logistics community began identifying comparable commercial processes that could be applied to enhance mission support while streamlining and improving process efficiencies. A broad spectrum of logistics processes were evaluated, including supply, transportation, repair and warehousing initiatives. One of the pivotal concepts was the feasibility of converting from three levels of aircraft maintenance to two levels of maintenance. With three levels of maintenance, there was repair capability on the flight line, within the back shops (base-level intermediate repair) and at the depot. The two levels of maintenance concept removed the back shop—or intermediate repair—capability at the bases and consolidated it at the depots. Subsequently, several studies were initiated to examine and evaluate current logistics processes and their capability to support a two-level maintenance system.

The most noteworthy was a series of tests conducted on aircraft avionics components, called Coronet Deuce. Conducted in three phases, these tests focused on evaluating existing base level and depot logistics systems and designing streamlined processes based on successful commercial practices. Notable innovations in both the base level and depot transportation processes resulted in significantly reduced repair cycle times. These initiatives laid the ground work for what would soon become the new Air Force logistics structure—Two-Level Maintenance.

While the Air Force was still conducting the Cornet Deuce tests, a 1992 Defense Management Report Decision (DMRD) 983 formalized the decision to convert the Air Force to a Two-Level Maintenance environment. This decision eliminated base level maintenance repair facilities and the associated personnel, subsequently increasing base

reliance on depot maintenance support. Just as importantly, DMRD 983 also eliminated the Logistics Airlift (LOGAIR) system, which provided parts movement for DOD shippers within the continental United States, to and from repair depots. As a result, DOD customers were forced to find new ways to ship these critical assets.

These two simultaneous decisions of DMRD 983 had far reaching consequences within the logistics community. Not only had bases lost their base level repair capability, but the Air Force logistics airlift network that connected the bases to the depots was also gone. Exploring ways to provide responsive transportation support, Air Force logisticians began exploring the potential of adapting the shipping processes of commercial wholesale retailers. These retailers, they proposed, had similar requirements to those of the Air Force—multiple customers, an infinite number of shipping locations, and a requirement for fast reliable transportation. This new transportation process, dubbed Door-to-Door Distribution, moved critical cargo by commercial express carriers directly to and from the depots. Within the military logistics community, the program was unprecedented and totally successful. Thus, the Air Force soon came to rely on commercial express carriers to move critical assets and to meet transportation requirements to support Two-Level Maintenance.

Concurrent with Cornet Deuce testing and the transition to Two-Level Maintenance, the Air Force was also expanding its vision for the evolution of Air Force logistics. Lean Logistics became "an umbrella term that described the application and adaptation of the most successful public and private business practices to the USAF logistics system."[5] Evolving over time, the concept of Lean Logistics was a result of combined Air Force and RAND Corporation research. This combined research effort focused on streamlining

depot and base processes, enhancing military control of logistics operations and simplifying financial management.

RAND borrowed the basic concepts of Lean Logistics from a set of business innovations called Lean Production. Within the commercial industry, "Lean Production methods were developed to cope with a dynamic global marketplace in which customer needs and competitive threats change very rapidly. To succeed in such an uncertain environment, firms had to possess unprecedented responsiveness, flexibility and economy of effort."[6] RAND surmised that by adopting the same lean orientation, the Air Force logistics system could reduce their costs while simultaneously increasing responsiveness. Throughout the report, express commercial movement was emphasized and "for small packages, the [Lean Logistics] design suggests that priority commercial air freight always be used."[7] From RAND's Project Air Force, and the successes of the Coronet Deuce tests and Door-to-Door Distribution, one thing became clear: Express transportation was critically important to the new Air Force processes.

As discussed earlier, the Air Force is faced with deploying forces worldwide to support any number of regional peacekeeping or humanitarian missions. Vital to the success of these operations is the logistic community's ability to rapidly and reliably move and sustain its forces. The reduced infrastructure abroad, coupled with the Air Force move to Two-Level Maintenance, mandate an increasing reliance on commercial express transportation services to meet our critical mission requirements.

The Air Force proved its ability to support CONUS Two-Level Maintenance by relying on commercial express small package carriers. Within the CONUS, multiple express carriers are available to support our requirements and there is little variation

between the service provided by the various express carriers. However, within the international shipping market, this is not true. Ongoing research conducted by the Air Staff in PACAF and USAFE confirms that international commercial express service provided by a carrier varies considerably by country and/or region. Therefore, when choosing an international express carrier, a transportation manager must determine which carrier provides the best service to meet the Air Force requirements for a particular destination. But when selecting a carrier, transportation managers must take into consideration more issues than just how fast a carrier can move a package from point A to point B. Other areas of concern to the transportation manager include consistency in movement, information availability, carrier reliability, variety of services provided, intransit visibility and package tracking capability. Currently, there is no guidance or model available to help managers make this decision.

Recall that "a key premise in Lean Logistics is system responsiveness, which depends, of course, on the availability of responsive transportation."[8] The purpose of this research is to provide the framework for that decision making process. Specifically, this project will recommend initiatives to improve support of international Two-Level Maintenance/Lean Logistics requirements. To this end, this paper will address: (1) The criteria most important to commercial industry when selecting International Small Package Express Carriers, (2) how commercial industry evaluates International Small Package Express Carriers, (3) trends in the International Express Carrier selection and evaluation processes within commercial industry, and (4) the applicability of commercial practices to the Air Force transportation processes.

Assumptions: (1) Air Force senior managers will direct the use of commercial express small package carriers to support the Air Force's Two-Level Maintenance requirements abroad, (2) multiple carriers will be available for use by Air Force transportation managers, and (3) Lean Logistics will continue to play vital part in the future DOD logistics management.

Notes

[1] Lt. Gen. Gary H. Mears, *Defense Transportation Journal*, December 1993, 18.

[2] "Drawdown Legacy: Stress," *Army Times*, 11 March 1996, 12-15.

[3] Fogleman, Ronald R., "The State of Defense Transportation Preparedness, Part I," *Defense Transportation Journal*, August 1994, 11.

[4] United States Air Force, *USAF Lean Logistics Master Plan and Road Map, Version 3.0*, 31 January 1995, 17.

[5] Ibid., 17.

[6] I.K Cohen, R.A. Pyles, R.A. Eden, "Lean Logistics: A More Responsive, Robust, and Affordable System, *Rand Report DRR-630-AF*, Santa Monica, CA, RAND Corporation, 1994, 3.

[7] Ibid., 11.

[8] *USAF Baseline Lean Logistics Master Plan and Road Map: Version 3.0*, 29.

Chapter 2

Literature Review

The objective of the literature review is to explore current literature that will provide the framework to better understand our research proposal—development of recommendations to help transportation managers better support international two-level maintenance/lean logistics requirements. The review focuses specifically on those areas that most closely relate to the issues addressed in this project. The subjects reviewed include: (1) The "Just in Time" Management Philosophy, (2) benchmarking, (3) the Malcolm Baldrige National Quality Award, (4) current Air Force Transportation Practices, (5) the DOD Logistics Strategic Plan, (6) Two-Level Maintenance and the Coronet Deuce Tests, (7) Air Force Lean Logistics, and (8) previous research.

Just in Time (JIT)

"In manufacturing industries, logistics is concerned with the movement, storage, and control of goods from the acquisition of raw materials to the delivery of finished products."[1] Logistics has always been a critical link in providing services or products to customers; however, now it is receiving more emphasis than ever before. This evolution in importance and increased emphasis resulted from the realization that inventory carrying costs were eating up sizable portions of many businesses' yearly budgets. The

Logistics Engineering Center quotes an interesting statistic: "In 1992 inventory carrying cost was $243 billion for manufacturing and trade inventory in the United States." Naturally, this is an area that has been highlighted for possible cost-savings. The industry's solution? Just In Time (JIT).

The Japanese were the first to embrace the JIT philosophy or *Kanban*, which means "visible record." It is a means of pulling, versus pushing, parts through the assembly process. Production is initiated only when a worker receives a visible cue that assembly is needed for the next step in the production cycle. The worker then orders the product from the previous operation so it arrives just when needed. If one of the key processes fails to produce a quality part, the production line stops. Individual operators are their own inspectors and are cross-trained for a number of tasks. Constant monitoring of the system ensures it is continuously fine tuned.

Along the same lines, modern JIT philosophy seeks to create a "lean" system, operating with small inventory stocks, multi-skilled workers and a team organizational structure. This is in contrast to the "buffered" approach, which is characterized by large stocks of inventory and narrowly specialized work forces.[2] Joel E. Ross in *Total Quality Management, Text Cases and Reading*, refers to these contrasts as "just-in-time" versus "just-in-case." JIT infers that "less is best," while just-in-case involves using buffer or safety stocks. The reasons offered for using buffer stocks include avoiding risks of stockouts or failure of suppliers, getting better prices through volume purchasing, and price increase avoidance. However, drawbacks of maintaining large stock levels might include increased risk of obsolescence and deterioration, and increased space requirements for inventory storage. One of the best success stories is Chrysler's rise to

success using JIT. "Much of the credit for Chrysler's recovery is owed to the auto maker's early embracing of JIT. Chrysler found that it could take more than a billion dollars out of inventory and not even miss it."[3]

The main theme that is woven throughout all JIT literature, however, is that JIT is not just an inventory control system. It is a system of production and distribution that reaches into all functions and activities. If properly used, it will give benefits such as: "... the reduction of direct and indirect labor by eliminating extraneous activity; reduction of required facilities space in the form of costly warehousing facilities; reduction of setup time and schedule delays as the factory's production becomes a continuous operation; reduction of waste, rejects, and rework by detecting errors at the source; reduction of lead time due to small lot sizes. . . ."[4]

It is important at this point to understand the primary goal of this new management philosophy. David Hutchins in *Just In Time*, describes it as "the achievement of zero inventory, not just within the confines of a single organization, but ultimately throughout the supply chain. To achieve even partial success, it is necessary to think far beyond the scope of stock control to virtually all aspects of management control."[5] It requires a company to take a long-term approach. And, because JIT runs the gamut of production, it is impossible to emphasize one aspect of production over another. JIT must be seen as a systems approach to improving operations to the highest degree possible. The JIT philosophy seeks to create the "lean" system, operating with small inventory stocks, multi-skilled workers and a team organizational structure, which is contrasted with the "buffered" approach which is characterized by large stocks of inventory and narrowly specialized work forces. With less investment in stock inventories, and workers who can

perform many functions through the system, you can create a more efficient system. One example is when production is slowed down because one person is absent and there is nobody trained to perform his tasks. Another is when a company ties up unnecessary capital in inventory bought in bulk that may not be used for months or years.

JIT has had cascading effects throughout the industry. As a result of JIT, "logistics systems have to move, store and control more transactions, in a shorter time, with less lead time, more frequently, and logistics is the next major competitive edge for world class production and manufacturing."[6] JIT concepts have put tremendous pressure on the commercial transportation system as a whole. The demand for fast transit time and door-to-door delivery has created a new market within the transportation community and several companies have jumped at the challenge. The result has been premium transportation services, also known as next day air or overnight delivery. Transportation systems have become more responsive and more efficient. As the evolution progresses, it is apparent that companies are willing to pay the price for premium transportation when they can depend on their parts and supplies reaching the destination "just in time," rather than spending money on keeping a lot in stock "just in case."

"Emphasis on diverse services, timely delivery, competitive pricing, mobility and flexibility, together with an explosion of innovative transportation services, have created a significant demand for analytical technologies to aid in the design and operation of logistics systems."[7] The most common technique in America today for companies implementing JIT is applying "...heavy doses of computer power to achieve the kind of detailed, coordinated planning that human beings and their manual system simply are not capable of producing."[8] Sophisticated communications and computer systems are no

longer a luxury when implementing the JIT concept—today, they are a requirement. This is one of the areas that made JIT possible and will be critical in continuing its development.

As a company progresses while implementing JIT concepts, it will go through a period of time when the buildup of computer and communication systems is essential. In response to this requirement, a new concept is being developed called computer-integrated manufacturing (CIM). Under the CIM concept "computerized tracking is being integrated with computer-controlled materials handling and warehousing equipment."[9] Other new developments in response to JIT are the dense codes and radio frequency (RF) chips. Dense codes are "labeling systems that pack a great deal more information than today's familiar bar codes. With their capacity to store a great deal of information about the product and the customer, RF chips will facilitate tracking the movement of supplies and finished goods on a real-time basis."[10]

"Just in time" has had a tremendous impact on the logistics community, and as a result, significant changes have taken place in the business world. "Today's competitive pressures are forcing manufacturers to extend the enterprise well beyond traditional boundaries."[11] New processes and technology continue to emerge to meet the demands of today's new and evolving management philosophy. The JIT concept will undoubtedly continue to play a vital part in future successes realized throughout the logistics community.

Benchmarking

As you recall, benchmarking successful business practices and adapting them for use in the DOD was a key strategy to achieving the goals and objectives outlined in the DOD Logistics Strategic Plan. But what is benchmarking?

Benchmarking Defined

Benchmarking is "a systematic method by which organizations can measure themselves against the best industry practices. It promotes superior performance by providing an organized framework through which organizations learn how the "best-in-class" do things, understand how these "best practices" differ from their own, and implement change to close the gap. The essence of benchmarking is the process of borrowing ideas and adapting them to gain competitive advantage. It is a tool for continuous improvement."[12]

The Air Force Quality Institute simply defines benchmarking as the "process of finding and adapting best practices to improve organizational performance."[13] The process is simple. First you plan the benchmark study and then collect benchmarking data. After collecting the data, it must be analyzed, and finally identified best practices must be adopted.[14] Benchmarking is being used throughout commercial industry as well as the Air Force, and is the methodology used in this research paper.

The Benchmarking Management Guide identifies two conceptual approaches to benchmarking.[15] The first is *competitive benchmarking*. This approach seeks to measure organizational performance against your competitors and concentrates on relative performance within a narrowly defined set of parameters. The second approach is

process benchmarking. Instead of focusing only on competition in similar industries, this process goes one step further. It measures specific process performance and functionality against segment leaders in those processes. In other words, you look for the best warehouser or the best overnight shipper. You search for the "best practices" for operating a business, validating world class performance in any given sector. Within these two approaches four specific types of studies exist: internal studies, competitive studies, functional or industry studies, and generic benchmarking.[16]

An internal study is conducted within a multi-unit business that has several "like" divisions (e.g., General Motors). It compares the different divisions for best practices to determine which one operates the most efficiently, incorporating that particular division's processes throughout the entire corporation. This type of study may stifle innovation and the formation of new ideas, since it essentially stays within the same management structure.

The second study is the competitive study. In this study, an organization targets direct competition, and conducts its study through third parties (e.g., targeting the product distribution practices of one or more competitors). Obtaining information might be difficult, the information and statistics may be old, and it may be difficult to obtain information on future plans. Therefore, the results of he competitive study may be sporadic, at best.

A third study is the functional or industry study. This study compares similar methods in one broad class of industry, comparing one's own organization's performance against industry leaders. Since companies gain fresh ideas from outside their organization, this process offers a real chance for innovation.

Lastly, there is the generic benchmarking study, which compares practices and processes that are independent of the given industry. This is the broadest and most innovative approach, since it is not limited by the industry in which you operate.

Benefits of Benchmarking

Benchmarking provides several benefits. Robert C. Camp, author of "Productivity,- Where We Stand," has offered five noteworthy benefits: "(1) End-user requirements are more adequately met, (2) goals based on a concerted view of external conditions are established, (3) true measures of productivity are determined, (4) a competitive position is attained, and (5) industry best practices are brought into awareness and sought."[17] It is a proactive way to effect change and achieve world-class status.

Collecting Information Through Benchmarking

The first task in preparing for data collection during the benchmarking process is to focus on the processes you want to explore. What is it you want to gain from benchmarking? Once this task is accomplished, you must determine what method of data collection best suits your study. Methods include: telephone interviews, personal meetings and site visits, surveys [and inquiries], publications and media, and archival research.[18] According to Michael J. Spendolini, a noted expert on developing benchmarking studies and author of *The Benchmarking Book*, several factors determine which method is most appropriate. First, consider the time constraints of your study. The amount of time available affects the number of sources that can be queried and the method used. Under strict time constraints, telephone inquiries appear to be the best approach. Next, consider resource constraints. The number and types of people, and the

amount of funding to support your project, also affect the selection of methods. Additionally, experience is a factor—people tend to use those methods most familiar to them. Finally, if an information-collection philosophy exists, it must be considered. Most large corporations have a preference on which methodology should be used, and this preference is normally based on past successes with a particular method.

As stated in our title, we are benchmarking private industry best practices against current Air Force procedures, and we have chosen to use a telephone inquiry as the basis for our study. We will explain how an inquiry might be developed, using our own as the primary example. Since data is the lifeblood of the benchmarking study, the gathering means must reflect the goal being obtained, and questions must be developed that are appropriate to the process being benchmarked.

Inquiry Development

We followed a simple six step process which included designing questions, choosing a sample population, conducting the inquiry and maximizing responses by maintaining contact with the subjects of the study. After we completed these steps we analyzed our data. Our results can be found in Chapter 4.[19]

Bogan and English, in their book, *Benchmarking for Best Practices, Winning Through Innovative Adaptation,*" provide a framework for developing an effective benchmarking inquiry.[20] This framework includes discussion on how to develop your target population and how to develop effective questions, which might be multiple choice, forced choice, open-ended, or data point questions (quantified questions and "absolute answers," e.g., how many people are employed by a corporation?).[21]

A few cautions are in order regarding development of an inquiry.[22] The solicitor must avoid being vague or using overly precise wording. Additionally, he should not use double negatives and embedded questions, hypothetical questions, questions that imply bias, overlapping categories, vague and overly specialized abbreviations, or questions that are too personal or too demanding. At all times, the inquiry must be extremely professional or companies may defer from participating. Validity, ensuring the inquiry measures what it is intended to measure, and reliability, giving the same result on successive trials, are also extremely important.[23] Additionally, the inquiry must be tested in a real-world environment to determine whether a respondent is capable of answering the question and whether there are any reasons why the respondent would decline to answer the question.[24] Finally, questions have to be in a logical order that makes it easy for the interviewee to follow your thought process—start with general questions and work down to more specific ones.[25]

Telephone Interviews

Once you have formulated a well-developed and tested inquiry, it is time to implement it. Telephone interviews are the best method when faced with strict time constraints, but there are several advantages and disadvantages to telephone interviewing. According to Karlof and Ostblom,[26] the advantages to telephone interviewing are: it is easy to plan and conduct, it enables contact with a large number of resources, it can be conducted at almost any time, and it is relatively inexpensive. However, along with the advantages, several disadvantages must be considered, including "cold calling," which can be time consuming as you attempt to chase down company representatives. At best, in unplanned situations there could be numerous interruptions or wasted time in

exchanging telephone messages. Additionally, you are likely to be faced with the fact that since your respondent is unprepared, the depth of the responses may be shallow and not applicable to your study.

Bogan and English have developed what they call "Critical Success Factors for Telephone Interviewing" which, if followed, will ensure effective and efficient telephone interviewing techniques.[27] You should prepare the interview questions in advance and pretest them on the phone in one's own company. Before embarking on the interview process, make sure you prioritize your control group and coordinate calls on the benchmarking team. Search for points of contact within each company so you will have a knowledgeable person to query, and when contacting them, make sure you introduce yourself and keep the query on a professional level. Additionally, inform the contact exactly how long you expect to talk to them so they can then schedule the appropriate amount of time.. In doing so, you offer those interviewed the opportunity to arrange their schedules to provide you their undivided attention. Ensure you stick to your schedule. Offer to send the inquiry early so they will have some prepared notes on what the focus of the interview will be. Lastly, courtesy is extremely important since you are asking a company about what makes it the best, so express appreciation for the interviewee's time at the conclusion of the interview.[28] In following these guidelines, you are certain to develop a well-organized, well-planned inquiry that will be completed with ease and confidence, yielding the desired results.

Malcolm Baldrige National Quality Award (MBNQA)

In 1987, the United States Congress passed the Malcolm Baldrige National Quality Improvement Act (Public Law 100-107) to encourage Total Quality Management and leadership development within U.S. commercial industry. This was Congress' way of addressing the overall decline in quality and leadership permeating throughout American companies, their products and services. It was aimed at improving the nation's productivity growth and highlighted the fact that Americans needed to regain their competitive edge through improvement in the quality of products and services.

As a result of Public Law 100-107, the National Institute of Standards and Technology (NIST) developed the Malcolm Baldrige National Quality Award (MBNQA). "The award was named for Malcolm Baldrige, who served as the Secretary of Commerce from 1981 until his tragic death in a rodeo accident in 1987. His managerial excellence contributed to long-term improvement in efficiency and effectiveness of government."[29]

The Malcolm Baldrige National Quality Award "recognizes small and large service and manufacturing companies that demonstrate exemplary performance in both the way they run their companies and in the quality of their products and/or services."[30] The purpose of the Baldrige Award is twofold. The first is to recognize excellent companies and the second is educational: "to create an evolving body of knowledge on how organizations are able to change their cultures and achieve eminence, and to provide a means for other companies to learn and use this information."[31] The award provides an avenue for other companies to benefit from the award winners' experience. An integral part of each winner's responsibility is to share information on their successes in the quality arena with other U.S. corporations.

Current Air Force Transportation Practices

In order to fully understand the procedures currently being used within the Air Force for shipping high priority small package international shipments, and to better define the process we are seeking to improve, a review of Air Mobility Command (AMC) and base-level Traffic Management Office procedures was conducted.

Air Mobility Command Transportation Practices

Air Mobility Command (AMC) falls organizationally under the Department of Defense and is the Air Force component of the United States Transportation Command (USTRANSCOM). It serves as the primary "air arm" of the United States military. AMC's primary mission is to provide rapid, global mobility and sustainment for America's armed forces. In addition, the command is responsible for stateside aeromedical evacuation and continues a tradition of humanitarian support at home and around the world.

AMC's transportation system is designed to move bulk, hazardous, oversized, and outsized cargo efficiently and effectively. All cargo destined overseas is shipped through one of AMC's five aerial ports (Charleston AFB SC, Dover AFB DE, McChord AFB WA, McGuire AFB NJ, and Travis AF, CA). Cargo typically arrives at the aerial port for routine or expedite movement. Upon arrival, cargo is in-processed, sorted by destination, and loaded onto regularly scheduled airlift missions called channel lift, or unscheduled lift called opportune lift.

In general, priority cargo moves before routine cargo. Furthermore, within the expedite and routine priorities, the cargo that arrives at the port first is shipped first.

Cargo transit time is measured from the port of embarkation (AMC aerial port of origin) to the port of debarkation (AMC aerial port within the destination theater).

Intransit visibility for cargo and passengers within the AMC system is currently less than ideal and improvements are underway. The Global Transportation Network (GTN) is USTRANSCOM's and AMC's solution for the intransit visibility problem. Once fully operational, GTN will provide intransit visibility on aircraft, passengers, cargo and ships throughout the DOD transportation system. It will enable USTRANSCOM and AMC to track each piece of cargo through the transportation data bases within each service. GTN is expected to be fully operational by 1997.

Air Force Traffic Management Office (TMO) Procedures

The base-level function of processing shipments for express shipment to the AMC aerial port for international movement begins with the Traffic Management Office. Here, Traffic Management personnel begin the process by ensuring all shipments are properly identified within the Cargo Movement Operating System (CMOS), the DOD automated system designed to streamline cargo processing and improve movement oversight.

Once all shipment data is verified within CMOS, the mode of transportation and route are selected. Routine and high priority shipments are transported by different modes. All routine shipments are shipped surface to their destinations, with transit time in the CONUS for these shipments averaging 3–5 days. High priority shipments, including two-level maintenance and lean logistics items, are shipped to their destination in the CONUS via express carrier. Express carriers normally guarantee next day delivery in the continental United States. If the shipment is destined for overseas, it is normally be

shipped via express carrier to the nearest aerial port of embarkation and entered into the AMC backlog to await onward transportation. However, if customer or mission needs dictate, the TMO may use a commercial express carrier to deliver the item directly to its destination overseas. Currently, no guidance exists to aid transportation personnel in selecting a carrier for international movement of these high priority items, and thus the focus of this paper.

From the TMO's perspective, meeting the customer's needs (time) is currently the most important criteria for carrier selection and it normally takes priority over cost. In other words, the customer's required delivery dates (RDDs) determine which mode of transportation is used.

The DOD Logistics Strategic Plan

The Deputy Under Secretary of Defense (Logistics) directed a comprehensive examination of the DOD's infrastructure and capabilities. This review was designed to provide a framework for a plan that would improve logistics performance despite reduced infrastructure. The resulting document—the DOD Logistics Strategic Plan—outlined goals, objectives and strategies to meet the challenges of the Post-Cold War force structure.

According to the DOD Strategic Logistics Plan, the logistics system mission is "to provide responsive support to ensure readiness and sustainability for the Total Force in both peace and war."[32] Additionally, it outlined three overall goals and urged each component to incorporate these goals into planning and management priorities.

The first goal—reduce logistics response times—focused on the need for "better, faster, more precise and highly mobile response capability and a leaner structure that better balances public/private capabilities."[33] The logistics steering group associated with the Strategic Logistics Plan determined that "each day of delayed response represented millions of dollars in inventories—moving, repair, delivered, stowed, used."[34] Thus by reducing response times, inventory requirements could be reduced and millions of investment dollars could be saved. Seventy-two (72) hours was established as a delivery standard from time of order until receipt at a CONUS installation or point of embarkation (aerial port) for international movements.

The second goal—develop seamless logistics systems—focused on finding ways to "remove impediments to the flow of information and the effective execution of closely related functions."[35] Clearly in the logistics arena, the flow of information is almost as important as the physical movement of material. Commanders at all levels need reliable, accurate information to make deployment and repair decisions. Now more than ever before, information flow is essential to operations.

The third and final goal—streamline the logistics infrastructure—focused on "providing efficient service to the customer by implementing successful business practices."[36] The ultimate objective was to reduce the total cost and footprint of logistics while providing an "optimum tooth to tail profile"[37] (i.e., more bang for the buck). A key strategy to this objective was to identify industry leaders with processes similar to those of the DOD logistics, benchmark their most successful practices and, finally, adapt the processes for implementation in DOD operations.

Two-Level Maintenance and the Coronet Deuce Tests

As stated in Chapter 1, the 1992 Defense Management Report Decision (DMRD) 983 formalized the decision to move to a two-level maintenance environment within the Air Force. DMRD 983 contained four initiatives designed to save over $384 million between FY94-FY99. Two of the initiatives had significant impact on the Air Force logistics community—the elimination of the Logistics Airlift (LOGAIR) system and the initiation of Two Levels of Maintenance. "Two-Level Maintenance converts maintenance for avionics and engines to two levels of maintenance from three levels by using modern communications, computer controls and transportation systems to rapidly move unserviceable parts through the repair process."[38] Under three levels of maintenance, repair capability exists on the flight line, within the back shops (base-level intermediate repair) and at the depot. The Two-Level Maintenance concept removed the back shop—or intermediate repair—capability at the bases and consolidated it at the depots. Air Force senior leaders concluded that the concept of two levels of maintenance was worth pursuing if the current weapons system capabilities could be maintained while consolidating intermediate maintenance at the depots. These initiatives were indicative of the DOD's continuing efforts to streamline the management structure while retaining capacity.

Under Air Staff's direction, several studies were initiated to examine and evaluate current logistics processes. The most significant of these were a series of tests conducted on aircraft avionics assets called Coronet Deuce. The Coronet Deuce tests were designed to determine if existing transportation systems could support the movement of critical, time reliant Two-Level Maintenance cargo. The Coronet Deuce tests were conducted in

three phases and ran from July 1991 to October 1993. Coronet Deuce I ran from July 1991 to March 1992 and simply evaluated the current system as it existed. The goal during this phase was to determine the potential problem areas or bottlenecks. No process improvements were initiated during this phase.

There were two notable findings from the analysis of Coronet Deuce I data. First, the reparable pipeline—the movement of broken parts from the base to the depot for repair—averaged 54 days, and second, there was no way to accurately measure transportation processing, transit or awaiting shipment times.[39]

After analyzing the results of Coronet Deuce I, several process improvements were designed and implemented in Coronet Deuce II, which ran from July 1992 to September 1992. The goal of Coronet Deuce II was to streamline the processes associated with parts movement in order to reduce the pipeline times and ultimately reduce the inventory requirements. During this phase, logisticians at all levels measured and analyzed the results of newly implemented processes, constantly looking for ways to further streamline and improve them.

Significant process improvements were made during this phase and, as a result, several of the improvements were institutionalized. Most notable was the use of commercial express carriers to move high priority materials to and from the depots. Clearly, transportation's role in the Two-Level Maintenance process was becoming increasingly important. It was clear that without efficient transportation systems, Two-Level Maintenance would not work.

The second initiative formalized in Defense Management Report Decision (DMRD) 983 involved the elimination of the Logistics Airlift (LOGAIR) system. The LOGAIR

system was the primary method DOD shippers used for moving serviceable and reparable parts within the continental United States (CONUS) to and from the depots. Consequently, DOD customers had to find new ways to ship their critical assets. As a result, not only had bases lost their base level repair capability but the logistics airlift network that connected the bases to the depots was also eliminated.

In September 1992, the LOGAIR system was terminated, and DOD customers were forced to move all their materials to and from the repair depots commercially. The work done during Coronet Deuce II laid the ground work for a transportation initiative called Door-to-Door Distribution (D3). The D3 concept gave the Air Force door-to-door service, time-definite delivery (guaranteed delivery times), and intransit visibility.[40] Logistically, the program was unprecedented and totally successful. The Air Force became reliant on the commercial transportation industry to move our time critical assets and meet two-level maintenance movement requirements.

Coronet Deuce III ran from October 1992 to October 1993 and was a continuation of Coronet Deuce II. In this phase, logisticians continued testing and refining the Two-Level Maintenance processes from Coronet Deuce II. During Coronet Deuce III, several key transportation processes were refined and institutionalized. Besides Door-to Door Distribution mentioned above, other transportation initiatives included Repair and Return processing (R2P) and Mail-Like Matter Movement (M3). Repair and Return Packaging processing streamlined both base and depot movement processes by eliminating non-essential handling nodes. The process was created to expedite base-level handling, move parts through the transportation system quickly, and return items to the source of repair as quickly as possible.[41] Mail-Like Matter Movement tested the capability of express

package carriers to move classified material without the normally required protective security service requirements. All three initiatives—Door-to-Door Distribution, Repair and Return Packaging, and Mail-Like Matter Movement—reduced overall repair cycle time by reducing transportation time and were more cost effective than current practices. Subsequently, each initiative was implemented at the conclusion of testing. From all these tests, one thing became clear: express transportation was critically important to the new processes.

Air Force Lean Logistics

By the summer of 1992, the framework for the USAF Lean Logistics program was complete and consisted of six key areas. The six key areas were: (1) User-in-control, (2) more responsive base and depot operations, (3) organic/non-organic competition, (4) reengineered depot shop flows, (5) enhanced Integrated Weapon System Management (IWSM), and (6) continuous process improvement.[42] Lean Logistics became an umbrella term that described the "application and adaptation of the most successful public and private business practices to the USAF logistics system."[43] Simultaneously, RAND Corporation was asked to support the Air Force restructuring and to focus their attention on creating a more responsive base and depot operation—one of the six key areas.

In response to the Air Force's request, RAND initiated Project Air Force—focusing on streamlining depot and base processes, enhancing military control of logistics operations and simplifying financial management. RAND borrowed the basic concepts of lean logistics from a set of business innovations called "Lean Production."

Within the business industry "lean production methods were developed to cope with a dynamic global marketplace in which customer needs and competitive threats change very rapidly. To succeed in such an uncertain environment, firms had to possess unprecedented responsiveness, flexibility and economy of effort."[44] In their report to the Air Force, RAND stated that by adopting the same lean orientation, the Air Force logistics system could reduce their costs while simultaneously increasing responsiveness.

Throughout their report, RAND emphasized express commercial movement. RAND's project concentrated on simplifying and streamlining processes in an effort to reduce inventory and infrastructure while increasing responsiveness to the customers. They identified the need for improved movement times as the first necessity to improve the logistics process. RAND pointed out that use of military aircraft for the delivery of small packages actually increased movement times. This was due primarily to the military's aircraft utilization policies of moving large, "economically viable cargo loads." Decreasing the economy of scale is viewed as an inefficiency and too costly. "Increasing the scale so that shipment costs do not get out of hand decreases flow times. Commercial carriers are able to improve their scale by serving multiple customers. The Air Force's use of these commercial transporters will provide more affordable costs and more relevant flow times. For small packages, the [Lean Logistics] design suggests that priority commercial air freight always be used."[45]

The Two-Level Maintenance program was selected as a model for the Air Force Lean Logistics concepts. The work done during the Coronet Deuce tests and RAND's Project Air Force laid the foundation for the innovations effected under the Lean Logistics. Focusing on continuous improvement, lean logistics initiatives attempt to "promote

combat capability, enhance war fighting sustainability, reduce mobility footprint and reduce infrastructures."[46]

Simply stated, the goal of Air Force Lean Logistics is to meet user needs at the least cost. To effectively manage the logistics operations of the future, there will have to be a "critical tradeoff between service levels, inventory carrying, inventory purchasing, transportation, warehousing and information processing costs."[47]

Currently, there are several ongoing initiatives in the supply, aircraft maintenance, transportation and depot maintenance areas to continue improving and streamlining Air Force logistics processes. Clearly, improving transportation processes is paramount to achieving the Air Force Lean Logistics goals.

"A key premise in Lean Logistics is system responsiveness, which depends, of course, on the availability of responsive transportation."[48] The Air Force Lean Logistics Master Plan lists several ways responsive transportation supports Lean Logistics. These include: time definite delivery, door-to-door delivery, reduced order and ship times, reduced mobility footprint, data to support analysis and command and control decisions, and leveraging increased transportation costs with inventory reductions.

Time definite delivery means reduced variability in pipeline transit times. Providing customers with reliable delivery of assets is key to the Lean Logistics system. Door-to-door delivery reduces cargo handling and incorporates a "just-in-time" delivery concept into our processes and simplifies the movement process by producing a seamless flow from the shipper to the end user. By using Door-to-Door delivery processes, order and ship times are dramatically reduced by eliminating unnecessary nodes from the traditional defense transportation system. Historically, logistics personnel have compensated for

pipeline variability by taking more spare parts, thus reducing variability will reduce the requirement for spares.[49]

The Lean Logistics transportation practices have reduced the mobility "footprint" by providing a more reliable resupply pipeline. The data provided by the current and developing logistics systems provides managers at all levels with information vital to command and control.

The development of advanced information systems, such as Air Traceability and Control-Air Force (ATAC-AF) and the Global Transportation Network (GTN), have significantly improved the visibility of assets as they move through the pipeline. As well as eliminating duplicate requisitions, accurate pipeline information enables commanders to make educated operational and repair decisions. Finally, from a cost standpoint, "the relative costs of transportation and information are dramatically less than the costs associated with initial inventory purchasing, and inventory carrying costs. Investment in express delivery services will recoup significant cost saving."[50] Transportation not only provides "time and place utility," but also provides vital information necessary to making management decisions. "The cost of a transportation service failure to deliver a critical part when and where required may be significant in terms of weapons system downtime, customer dissatisfaction, and unnecessary expenditures for stock and storage."[51]

Review of Previous Research

In an effort to gain understanding of the issues faced by transportation professionals in commercial industry, we reviewed several pieces of previous research. Works by noted academic researchers, including LaLonde, Zinszer, Stock and Lambert, were

reviewed for application and relevance to this research project. Although significant research exists on motor carrier selection, none of the reviewed research was relevant to our work. Previous research related to either the process of carrier selection or focused on motor carrier selection (vice air express carriers). These areas, although distantly related to our project, did not provide a significant contribution to our research.

Summary

The objective of this literature review was to gain knowledge and insight concerning the events that have brought us to where we are today in Air Force logistics, including current transportation practices, commercial industry's involvement in improving quality and streamlining processes within their organizations, and programs that recognize the "best-in-class" in today's corporations. We will now solicit inputs from those companies who are honored recipients of the Malcolm Baldrige National Quality Award—those companies that have demonstrated exemplary performance in both the way they run their companies and in the quality of their products and/or services. Our inquiries will determine the criteria they employ to select and evaluate the transportation carriers used by their companies. Their responses will be used to develop a recommendations that will enable Air Force transportation managers to better support Two-Level Maintenance and Lean Logistics requirements. Chapter 3 will address the specific research methodology used in this study.

Notes

[1] Microsoft Internet Explorer, Logistics Engineering Center, 1.

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[2] Joel E. Ross, *Total Quality Management, Text Cases and Readings, Second Edition* (Delray Beach, FL, St. Lucie, Press, 1995) 66 and 69.

[3] Tucker and Davis, "Key Ingredients for Successful Implementation of Just-In-Time: A System for All Business Sizes," *Business Horizons*, 36, No. 3, (May-June 1993): 59.

[4] Ibid., 166.

[5] David Hutchins, *Just In Time* (Tiptree, Essex, Great Britain, Anchor Press, Ltd., 1988) 5.

[6] Microsoft Internet Explorer, Logistics Engineering Center, 2.

[7] Ibid., 2.

[8] Eugene Richman and William B. Zachary, "Creating Strategies For Successful Materials Management," *Industrial Management*, 36, No. 2, (March/April 1994): 24.

[9] Ibid., 25.

[10] John H. Sheridan, "Beam Out This Shipment, Scotty," *Industry Week*, 244, No. 17 (18 September 1995): 37.

[11] Ibid., 41.

[12] Dale H. Besterfield, *Total Quality Management* (New York, Prentice Hall, 1995), 243.

[13] Holmes, Susan, ed., *Process Improvement Guide, Second Edition* (Maxwell AFB, AL, Air University Press, September 1994), 92.

[14] Ibid., 22-23.

[15] *The Benchmarking Management Guide* (American Productivity and Quality Center, Portland, OR, Productivity Press, 1993) 5.

[16] Ibid., 6.

[17] Robert C. Camp, "Productivity - Where We Stand," William F. Christopher, ed., *Handbook For Productivity Measurement and Improvement* (Portland, OR, Productivity Press, 1993) 1-9.9; Bogan Christopher and English, Michael, *Benchmarking for Best Practices* (New York, McGraw-Hill, Inc., 1994), 36.

[18] Bogan and English, 151.

[19] *The Benchmarking Management Guide*, 46.

[20] Ibid., 91.

[21] Bengt Karlof and Svanter Ostblom, *Benchmarking: A Signpost to Excellence in Quality and Productivity* (New York, John Wiley and Sons, 1993), 131.

[22] *The Benchmarking Management Guide*, 47.

[23] Karlof and Ostblom, 130.

[24] *The Benchmarking Management Guide*, 47.

[25] Karlof and Ostblom, 136.

[26] Ibid., 152.

[27] Bogan and English, 94.

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[28] Karlof and Ostblom, 136.

[29] Heaphy, Maureen S. and Gruska, Gregory F., *The Malcolm National Quality Award: A Yardstick for Quality Growth* (New York, New York, Addison-Wesley Publishing Company, 1995) 43.

[30] Brown, Mark Graham, *Baldrige Award Winning Quality: Fourth Edition, How to Interpret the Malcolm Baldrige Award Criteria* (Milwaukee, WI, ASQC Quality Press, 1994) viii.

[31] Heaphy and Gruska, xvii.

[32] United States Air Force, *USAF Baseline Lean Logistics Master Plan and Road Map, Version 3.0* (Washington D.C.: 31 January 1995) 11.

[33] Department of Defense, *Logistics Strategic Plan, Edition 1994* (January 1994), 7.

[34] Ibid., 7.

[35] Ibid., 11.

[36] Ibid., 13.

[37] Ibid., 12.

[38] Ibid., 22.

[39] Donald Izbicki, Headquarters Air Combat Command, personal interview with Major Linda Dahl, 1 December 1995

[40] Ibid., 61.

[41] Ibid., 61.

[42] Ibid., 17.

[43] Ibid., 17.

[44] Cohen, Pyles, and Eden, 3.

[45] Ibid., 11.

[46] *USAF Baseline Lean Logistics Master Plan and Road Map, Version 3.0*, 31 January 1995, 11.

[47] Ibid., 13.

[48] Ibid., 29.

[49] Ibid., 35.

[50] Ibid., 36.

[51] Ibid., 35.

Chapter 3

Methodology

This chapter details the methodology used during our research project. Because our research focuses on adapting "best practices" within civilian industry for use within the Air Force, we patterned our methodology after the classic benchmarking principles highlighted in Chapter 2. This specific methodology requires a literature review, followed by implementing the benchmarking process which involves: (1) Population and sample identification, (2) inquiry design, (3) data collection via telephone interview, and (4) data analysis. Following the data analysis, we will provide recommended initiatives to senior Air Force logisticians to adjust or amend Air Force transportation policy for better support of international Two-Level Maintenance/Lean Logistics requirements.

Literature Review

The purpose of the literature review was fourfold: (1) Gain insight into the evolution of Air Force Lean Logistics, (2) gather information from academic and commercial sources on procedures and principles that parallel those within the Air Force, (3) examine the role of express transportation within commercial industry and the Air Force, and (4) review existing research for applicable concepts, tools and/or processes. Specific topics explored during the literature review included the development and growth of Air

Force Lean Logistics, the "Just In Time" (JIT) management philosophy, JIT's impact on industry with specific emphasis on transportation's role, benchmarking as a mechanism for process improvement and the Malcolm Baldrige National Quality Award program. The literature review provided a solid foundation for this research and aided the researchers in the design and development of the data collection tool used to query civilian industry.

Population and Sample Identification

Selecting commercial companies for benchmarking was based on three basic criteria. First, the companies had to have a mission similar to that of the Air Force. Here, we sought stable companies who had potential world wide commitments. Second, the companies had to have a requirement to ship priority packages internationally on a regular basis. After evaluating several potential methods of selecting candidate companies, we decided to limit our search to those companies who had won the Malcolm Baldrige National Quality Award. Thus, selection as a Malcolm Baldrige National Quality Award winner became our third criteria.

Since selection as a Malcolm Baldrige National Quality Award winner was the most limiting factor, this became our first standard. All winners from 1988 through 1993 were considered. This criteria was narrowed slightly by zeroing in on the winners of the Baldrige Award in manufacturing and excluding those in the service and small business areas. This was done because companies in the manufacturing area have transportation requirements (missions) similar to those of the Air Force. The preliminary screening

resulted in 10 potential companies within the parameters of the first and third criteria. This provided a perfect starting point for selecting worthwhile benchmarking prospects.

The second criteria required the companies to service customers overseas, and to support those customers with priority express shipments. This criteria fine tuned the list of candidate companies and increased the odds that the companies queried would have process requirements similar to the Air Force. The final list of companies appears at Appendix A.

Inquiry Design

In designing the inquiry, we used the information gathered from various sources reviewed in Chapter 2. A preliminary inquiry, which focused on current commercial industry practices regarding the selection and evaluation of transportation carriers, was developed and consisted of four parts:

Part A addressed general information concerning the priority of cargo shipped and the type of service used. Open-ended and data point questions were used to gain insight into the scope of the company's operations and confirm their suitability for participation in the research project.

Part B was developed to assess the company's selection of transportation carriers to move their high priority small package international shipments. A variety of open-ended questions were used to address carrier selection, international customs procedures and documentation. Additionally, a "scaled" question listing twelve criteria for carrier selection was included to allow companies to "rank order" their five most important criteria.

Part C asked three open-ended questions regarding carrier evaluation and the recovery of freight charges if the carrier does not meet established delivery times.

Part D allowed participants to provide additional comments not addressed in previous questions.

Pretest

The preliminary inquiry was pretested to verify the clarity and validity of the measurement tool. To evaluate the inquiry, five individuals with expertise in transportation and logistics, as well as five from non-related career fields, participated in the pretest. Participants were asked to review the inquiry for clarity and identify additional areas that should be included in the inquiry. Following the pretest, comments were reviewed and evaluated, and adjustments were made to the preliminary inquiry. A final inquiry was developed and appears at Appendix B.

Data Collection

Because of the time constraints imposed on the completion of this project, we examined various methods of data collection and determined that telephone interviewing, using the finalized inquiry (Appendix B), would be the best method to use. Upon selection of the 10 companies (Appendix A), team members were randomly assigned companies to contact for the interviews. Initial telephone contacts were made 14-29 February 1996 using the script at Appendix C. During this initial contact, a company point of contact was established and interviews were scheduled with the point of contact for a later date. After initial contact, a copy of the inquiry and a cover letter (Appendix D) were faxed to the points of contact explaining the purpose of the project and

expressing our appreciation for their support. In most cases, interviews were completed within five days of the initial contact. All interviews were completed by 8 March 1996, and inquiry responses are at Appendix D.

Data Analysis

Benchmarking is the "process of finding and adapting best practices to improve organizational performance."[1] While benchmarking often involves the analysis of just one company's processes, we chose a wider field to provide us with a greater variety of responses from which to develop our model. No statistical analysis will be required. Results and analysis of the data will be presented in Chapter 4.

Data analysis will be conducted in four phases: 1) Analysis of carrier demographics, 2) Analysis of carrier responses, and 3) Identification of trends. First, a general summary of each company contacted will be done to provide a framework for the analysis. Second, carrier responses will be summarized and analyzed. This thorough review and analysis of each response will provide the raw data needed in the trend and application analysis. The data analysis will cover the two specific areas addressed in Parts B and C of the inquiry (Appendix B)—carrier selection and carrier evaluation. Finally, a trend analysis will be conducted to identify common initiatives or processes among the companies queried.

Recommendations and Conclusions

Recommended initiatives will be developed from the analysis and provided to senior Air Force logisticians for possible implementation in support of the Air Force Lean Logistics program. Conclusions will also be developed and included in Chapter 5.

Summary

This chapter presented the specific research methodology developed and used in this study. A classic benchmarking approach served as the primary guide in our research methodology. This chapter provided a detailed discussion of population and sample identification, inquiry design, pretest, data collection and data analysis. Complete results and analysis will be presented in Chapter 4.

Notes

[1] Holmes, Susan, ed., *Process Improvement Guide, Second Edition* (Maxwell Air Force Base, AL, Air University, September 1994) 92.

Chapter 4

Results and Analysis

This chapter will present the results of the data analysis. The information will be presented in two sections: Company Summaries and Performance Trends. First, company responses to the inquiry will be presented in summary form. These summaries are broken down by two categories—carrier selection and carrier evaluation. Second, results of the trend analysis will be presented. Here, we discuss programs or management principles that were common among the carriers interviewed. This analysis will provide the foundation necessary to evaluate the commercial practices for applicability to Air Force Transportation.

Company Summaries

As discussed in Chapter 3, our initial information search began with the 10 Malcolm Baldrige Award winning companies identified in Appendix A. After initial screening, all but three companies were eliminated. Reasons for elimination ranged from a company lack of interest in the study to failure to meet the basic research requirements (e.g., no express international shipment requirements). The company summaries for the qualifying companies—Motorola Corporation, Milliken and Company, and Solectron Corporation—are presented below.

Motorola Corporation

Motorola is one of the world's leading providers of wireless communications, semiconductors and advanced electronic systems and services. Major equipment businesses include cellular telephone, two-way radio, paging and data communications, personal communications, automotive, defense and space electronics and computers.[1] Motorola ships over a million international small express packages to their worldwide customers each year.

Carrier Selection. When selecting international express carriers, logistics managers at Motorola select the carrier that provides the best service to a specific location or region for the best price. Managers receive corporate direction on the carrier selection process through published guidance. This guidance is a product from Motorola's Traffic Council; a unique organization we will address later in this chapter. It is Motorola's policy to rely on a variety of international express carriers because "some carriers simply outperform others in different regions of the world."[2] For example, when shipping a package to the Middle East, Motorola will typically use DHL because, in Motorola's opinion, they provide the best service to that region of the world. When shipping to Germany, on the other hand, Federal Express is their carrier of choice. Simply stated, Motorola selects carriers based on best overall performance, best prices and best customer service.

Motorola selects their international carriers from those currently on contract with the corporation. Each year, Motorola's Traffic Council negotiates very specific contracts with their carriers, ensuring that prices, movement standards, customs clearance procedures and penalties are clearly stated and understood. According to Susan Skilnyk,

a Logistics Analyst in Motorola's International Logistics Export Traffic Department, the contracts are a very important part of Motorola's relationship with the carriers. "Without a written contract, you're left wide open for problems—a contract tells the carrier *what you want* and *how you want it* done—without one[a contract], the carrier performs how he *thinks you want it done*."[3] Additionally, Motorola believes the contract gives the carrier and the shipper the assurance of a long term relationship.

Motorola has instituted an innovative in-house committee called the Traffic Council to, among other things, research, develop and negotiate the carrier contracts. The Council is composed of a mixture of Motorola employees who have expertise in shipping processes and representatives from Motorola's legal department. The Council meets semi-annually to discuss transportation issues (carrier service, customs requirements, etc.) and to make recommendations/decisions about carrier selection to various locations worldwide. According to Susan Skilnyk, the "council is basically a steering group which pushes for the best possible service to [our] customers."

When asked to rank the criteria Motorola uses in selecting an international express carrier, Susan Skilnyk prioritized the criteria as follows: (1) Total transit time, (2) range of destinations, (3) cost, (4) carrier liability, and (5) accuracy of response to an inquiry. However, Mrs. Skilnyk repeatedly emphasized that each of our "listed criteria are critical and should be addressed in the contractual agreements." The criteria identified lend insight into Motorola's commitment to providing reliable global support to their customers. Specifically, Motorola's customers rely on them to be responsive to their needs/requirements—often within very limited time frames. Motorola, in turn, requires the same responsive, reliable service from their commercial carriers.

Motorola prepares the invoices and documents necessary for the customs clearance process. But, because the carriers have streamlined the customs clearance process so effectively, Motorola relies on the carrier to clear the packages through customs.

Carrier Evaluation. Motorola constantly evaluates carrier performance. Because their business relies on fast, reliable service, Motorola's logistic managers—and their customers—keep a watchful eye on package movements. Through meticulous daily management, as well as carrier provided quarterly reports, Motorola managers evaluate carrier performance. The quarterly reports provide a detailed record of the shipments handled, including information on pick-up, delivery, transit time and cost per shipment.

Packages shipped international express are generally in response to an immediate and unplanned customer requirement. Interestingly, Motorola's service commitments often include a financial liability by Motorola if they can not meet a customer's requirement. In turn, Motorola stipulates carrier financial responsibility in their carrier contracts, which enables Motorola to pass their penalty charges on to a carrier if the order was not met due to the carrier's action or inaction. Motorola views recouping freight charges and passing penalties on to the carrier as "just a matter of good business,"[4] and although it is a time consuming process, it is worth the effort.

Milliken and Company

A leading international textile and chemical firm, Milliken and Company is one of the world's largest privately held companies. With a rich history of innovative accomplishments and high quality products and services, Milliken has been recognized with awards and accolades, including the Malcolm Baldrige National Quality Award, the European Quality Award, the British Quality Award, and the Canadian Quality Award.

Carrier Selection. Milliken and Company handle approximately 8,000 international express shipments each year. Like Motorola, Milliken uses multiple carriers to support their international shipment requirements. According to Dan Hedgepath, General Traffic Manager for Milliken, international express shipment requirements are centrally managed by the corporate Traffic Office. Unlike Milliken's bulk and CONUS express shipments, where a carrier is automatically selected by the company's automated shipping system, carriers for express international shipments must be selected manually. Because of the diverse and complicated requirements for international express shipments, Milliken "prefers that all international express shipments are processed through the corporate Traffic Office."[5] According to Mr. Hedgepath, this is done primarily to ensure the right carrier is selected and to take advantage of consolidating shipments which could result in significant cost efficiencies. When selecting a carrier for an international shipment, he chooses the carrier that can provide the best service at the lowest cost. Accepting the fact that express carrier services vary by either price or capability in a given international region, Milliken focuses on buying a carrier's strengths. In short, Milliken buys value added services from the carrier's menu of services.

Milliken contracts services with carriers and uses the contracts to specify prices, customs procedures and service, and report requirements. Contracts are negotiated by the Traffic Office with assistance from the legal department on an as needed basis. The contracts are reviewed and updated annually. According to Mr. Hedgepath, the "benefit of a contract is the long term relationship with the carrier—a relationship built on a foundation of good communication."[6] This relationship leads to good service by the carrier and good prices for the shipper.

When selecting a carrier, Milliken's carrier selection priorities are: (1) Total transit time, (2) cost, (3) reliability of delivery, (4) range of destinations, and (5) speed of response to an inquiry. Milliken is committed to providing quick, reliable service to their customers, and to this end they rely on the international express carriers to support their efforts.

Carrier Evaluation. Milliken and Company evaluate their carriers by requiring them to provide monthly reports delineating movement times by shipment. Additionally, each report includes a shipment summary showing total on-time delivery percentages based on the contracted time standard. According to Mr. Hedgepath, Milliken uses this report to identify performance trends for each carrier. If carrier problems exist, Milliken will address the problems with the carrier using the report as the support documentation. If the problems continue, Milliken will stop using the carrier. The underlying assumption is that when the carrier recognizes that Milliken is no longer doing business with them, they will reform their ways to regain Milliken's business.

Milliken does not try to recoup costs from carriers because they find the process too time consuming and expensive. According to Mr. Hedgepath, the monthly reports provide good insight into the quality of the carrier's work. In Milliken's view, a carrier must maintain an overall on-time delivery rate in the 97 to 98 percent range to be considered acceptable. Additionally, he cited the fact that he just "doesn't have the staff" to chase down the details of every shipment in order to recoup charges. If a carrier falls below the acceptable standard and fails to improve in a reasonable period of time, Milliken simply stops using the carrier. This, he believes, is more cost effective than

maintaining a staff to scrutinize the carriers to the detail required to recoup shipment costs.

Solectron Manufacturing Corporation

Solectron Corporation is a large electronics manufacturer which competes worldwide. Solectron's manufacturing services primarily involve the assembly of computer systems and subsystems using surface mount, pin-through-hole, flexible circuit and emerging minter connect technologies. The company received the 1991 Malcolm Baldrige National Quality Award and has received more than 80 other quality and service awards from customers such as Apple Computer, Applied Materials, Exabyte, Hewlett Packard, IBM and Sun Microsystems. Solectron is headquartered in Milpitas, California, and has U.S. manufacturing operations in California, North Carolina and Washington; European operations in France, Germany and Scotland; and an Asian manufacturing operation in Malaysia, as well as a program office in Japan.[7]

Carrier Selection. Solectron handles two types of shipments—those generated by the company and those initiated by customers. Solectron generates approximately 50 high priority small packages to international locations each month. All other shipments dispatched by the company are initiated by customer requests and, in these cases, the customer pays for the shipment and selects the carrier.

When Solectron selects an express carrier for international shipments, their first choice is Federal Express. They only select a different carrier if Federal Express cannot meet their needs. When selecting a carrier (other than Federal Express), Solectron uses a company developed routing guide. This guide was developed to facilitate carrier selection while ensuring Solectron receives the best service. The routing guide contains

the preferred carrier, from the company's perspective, and the negotiated rates for each country or region of the world.

Preferred carrier status is earned by a carrier and is based on Solectron's organizational priorities. According to Solectron representative Jackie Arias, Head of Corporate Shipping and Traffic Department, the five top criteria, in order of importance, for selecting a carrier are: (1) Carrier liability, (2) Accuracy of Response to Inquiry, (3) On Time Delivery, (4) Total Transit Time, and 5) Pickup.

Solectron expects zero damages from their carriers. This is easy to understand considering the kind of products Solectron manufactures—computer mother boards—and damage to a mother board is often serious and expensive to repair. Therefore, it makes sense that carrier liability holds the most importance for Solectron. Overall, Solectron felt if a carrier had signed up to providing a certain service and level of service, then it was their responsibility to follow through with that commitment.

Like their carrier selection, Solectron's handling of international customs is based on who is identified as the shipper of record. If Solectron is the shipper of record, they take responsibility for the international customs requirements through a contracted customs house. If they are shipping products for another company (i.e., as the intermediate manufacturer), the original company assumes responsibility for the international customs requirements. Solectron's customs house prepares the entry documents, and completes all customs requirements. In addition, they prepare their own commercial invoices when they are the exporter of record. In conjunction with the customs house brokers, Solectron uses harmonized system codes to improve processing and efficiency.

As an intermediate manufacturer, Solectron puts increased emphasis on carrier versatility. They have a variety of needs and tend to select a carrier that can meet those needs in an all-encompassing way.

Carrier Evaluation. As stated above, Solectron requires all their contracted carriers to provide monthly activity reports which include on-time transit data and delivery accuracy. Selectron uses this data to develop generic models for their shipping regions. The models are used to verify that the carriers are meeting the required metrics. During contract negotiations these models are further used to negotiate better performance standards at cheaper costs. The models give Solectron a tool to evaluate carriers with the hope of achieving better, faster and cheaper transport options. Solectron requires the carrier to reimburse shipping charges for any late shipments if the carrier was responsible for the late delivery.

Performance Trends

Analysis of the companies' responses revealed several trends, including: (1) Use of negotiated contracts, (2) use of multiple international express carriers, (3) a requirement for carrier-generated performance reports, (4) a reliance on carriers to handle customs clearance processes, and (5) company reimbursement for missed or late deliveries. Each of these trends will be discussed in detail in the following paragraphs.

Negotiated Contracts

All three companies interviewed during the course of this research negotiated very detailed contracts with carriers. Each of these contacts repeatedly emphasized the importance of spelling out very specific performance and service requirements in the

carrier contracts. Without clearly communicated direction, *carriers perform how they think* the company wants them to perform. Clearly, this is undesirable and often leads to service problems. At a minimum, these contracts should include specific requirements on transit time standards, delivery requirements, customs clearance procedures, reimbursement/penalty procedures, and report requirements.

The contract is the first step to developing a solid basis of communication between the carrier and the shipper, and is a tool to promote an effective and long term relationship with a carrier. The contract gives the company and the carrier the assurance of a stable relationship and this stability often results in better service to the customer. Additionally, companies see contracts as a valuable bargaining chip, especially in the area of price negotiation. According to our interviewees, this is especially true if there is a large volume of cargo involved.

Multiple Carriers

Two of the three companies interviewed used multiple carriers to support their international express requirements. Both Motorola and Milliken pursue carriers who provide the best service for a particular destination at the least cost. Putting "all the eggs in one basket," so to speak, is not considered good business by either Motorola or Milliken. Importantly, both these companies contend that certain carriers demonstrate stronger performance in some regions or countries of the world than other carriers. In Motorola's case, their carrier selection is guided by corporate decision makers (Traffic Council) who research, negotiate with, and select carriers to support their global shipment requirements. Milliken relies on the professional expertise and experience of their Logistics Managers to select the "best" carrier for a given destination. But when selecting

carriers, both companies focus on buying a carrier's strengths and rely on the carrier to provide value added services to the movement process.

Reports

All three companies rely on carrier-generated reports to evaluate carrier performance. Although report requirements are negotiated by each company independently to meet their specific needs, there were several commonalties in terms of report content. All reports contained detailed movement information, including pick-up and delivery data, shipment and customs costs, and use of any special services. Each report provided detailed information shipment by shipment, as well as an overall delivery summary (e.g., number of on-time deliveries vice the total number of shipments).

Report periods vary—Milliken and Solectron require monthly reports while Motorola receives them quarterly—but this is more a product of corporate policy than an indication of the report's importance to the company. There was a general belief among company representatives that the reports motivated carriers to provide better service simply because they knew the companies were scrutinizing their performance. All three company points of contact stated that the reports influence future carrier selection decisions. Additionally, Motorola and Solectron use the reports in their reimbursement/recoupment processes.

Reimbursements

While providing the companies with an evaluation mechanism, the carrier performance reports also provide the companies with the information necessary to initiate their reimbursement process. Once a discrepancy is identified, Motorola and Solectron

seek reimbursement for shipping costs and, in Motorola's case, any associated penalties. Companies see this process as one more way to keep the carrier in-tune with their requirements. By providing immediate feedback to the carrier on the company's satisfaction or dissatisfaction, the reimbursement process gives the carrier the opportunity to change or adjust a process to avoid future penalties. For companies and carriers alike, immediate feedback is much more productive and results in a better working relationship.

Customs

Across the board, all of the companies rely on the commercial express carriers to handle the customs clearance process. According to company representatives, the commercial carriers have streamlined the processes and have the contacts necessary to make the system work. As they see it, this is the most effective and time efficient way to manage the customs processes.

All the companies create the necessary inventory lists and shipping documents required for the shipments. It is common practice for carriers to pay the customs fees and in-turn charge the companies for these.

Summary

This chapter presented the results of the data analysis. First, company responses to the inquiry were addressed by discussing issues relating to carrier selection and carrier evaluation. Next, the results of the trend analysis were presented. Analysis of company responses to the inquiries revealed five trends. These trends were: (1) The use of negotiated contracts, (2) the use of multiple international express carriers, (3) a requirement for carrier-generated performance reports, (4) a reliance on carriers to handle

customs clearance processes, and (5) shipper reimbursement for missed or late deliveries.

This analysis will provide the basis for the recommendations presented in Chapter 5.

Notes

[1] Motorola Internet Home Page, www.motorola.com, 12 March 1996.

[2] Susan Skilnyk, Motorola Corporation, telephone interview with Major Linda Dahl, 20 February 1996.

[3] Ibid.

[4] Ibid.

[5] Daniel Hedgepath, Milliken and Company, telephone interview with Major Linda Dahl, 15 February 1996.

[6] Ibid.

[7] Solectron Public Relations Information, www.oakridge.com.

Chapter 5

Recommendations and Conclusions

Recommendations

During our research, several practices used by commercial industry surfaced that, if adopted by the Air Force, would provide significant improvement to our logistics system. The benefits would be far-reaching and have long lasting, cascading effects throughout the logistics system. Concepts which have applicability to the Air Force include: Multiple international carrier contracts, detailed contracts, carrier-generated reports, reimbursement for late shipments, routing guides, and corporate logistics councils. These initiatives are discussed in more detail below.

Recommendation 1: Maintain Contracts with Multiple International Carriers

On the international level, a corporation or organization should not limit itself to one carrier, because different carriers have varied capabilities. Certain carriers specialize in specific regions of the world and therefore excel in supporting that region. Additionally, carriers place different emphasis on the various elements of service (e.g., total transit time, asset tracking). In the midst of a push for the DOD to operate under a single contract for CONUS small package express service, senior Air Force leadership should take note of the importance and potential benefits of maintaining contracts with more

than one international carrier. Having multiple contracts would increase competitiveness and flexibility, and allow the Air Force to take advantage of each carrier's strengths.

To implement this recommendation, we propose that Air Mobility Command (AMC) remain the central project office for contract management. They would negotiate the contracts with inputs provided by the Air Force Major Commands (MAJCOM) and Air Logistics Centers (ALC). Through research, the MAJCOMs could develop a listing of carriers that service their areas of responsibility (AOR), as well as specific information about the carriers' capabilities within their AOR. The purpose of this information would be to identify which carriers, in the eyes of the MAJCOM, provide the best service to the countries in their AOR. This concept is discussed in more detail under Recommendation 6: Logistics Council.

Recommendation 2: Detailed Contracts with Commercial Transportation Carriers

All the companies queried emphasized the importance of maintaining detailed, comprehensive contracts with international carriers. According to the company representatives interviewed, contracts provide the stability both the company and the carrier require. Additionally, the contracts provide specific performance and requirements standards which enable the carriers to meet and respond to the company's unique needs. To bring Air Force contracts more in line with those used by commercial industry, additional details/requirements should be added to current Air Force international carrier contracts. For example, Air Force contracts with international carriers should include requirements for detailed monthly carrier-generated reports, specific report contents, a stipulation for funds recoupment for carrier-caused late deliveries, and how funds will be tracked and transferred. These areas will be addressed

further in Recommendations 3 and 4. Additionally, the contracts should include requirements for special handling, intransit visibility, customs (customs requirements vary by country so, contracts should include what documentation and services will be provided by the carrier and those that will be the responsibility of the Air Force), and electronic data interfaces, as well as carrier evaluation criteria and delivery schedules. The evaluation criteria should be performance based and focus on on-time deliveries. In keeping with commercial trends, we recommend carriers be held to a 97 percent monthly on-time delivery rate. Additionally, the contracts should identify the consequences of failing to meet the required standard. We recommend that if a carrier falls below a given standard for three consecutive months, the carrier should be placed on probation. Delivery schedules should be included for each region. A matrix would be an effective way of portraying this information. Table 5-1 shows a fictitious delivery schedule for an express package shipped from the CONUS to the destination noted. For instance, if a package was shipped from the CONUS to Saudi Arabia on Monday (Mon), then we could expect it to be delivered to its destination on Wednesday (Wed).

Table 5-1. Sample Delivery Matrix

Destination	Ship/Arr	Ship/Arr	Ship/Arr	Ship/Arr	Ship/Arr	Ship/Arr	Ship/Arr
Saudi Arabia	Mon/Wed	Tue/Sat	Wed/Sat	Thu/Sat	Fri/Sun	Sat/Mon	Sun/Tue
Italy	Mon/Wed	Tue/Thu	Wed/Fri	Thu/Mon	Fri/Mon	Sat/Mon	Sun/Tue

Recommendation 3: Detailed Carrier-Generated Reports

A good way to verify carrier's claims of service is to require detailed reports from each carrier. The requirement for detailed reports has the added benefit of improving communication between the carrier and the shipper. Reports are used by all the companies we queried and typically include information on pick-up and delivery dates/times, the total transit time required by the contract, and a summary line. The reports are a critical tool, used by managers at all levels, to evaluate both company and carrier performance. Corporate traffic managers use the reports to identify trends in an effort to resolve issues before they become problems and affect customer service. The reports remind carriers that we are scrutinizing their performance and they encourage the carriers to be more aware of the service they are providing.

The Air Force should include a requirement for periodic carrier-generated reports in their contracts, and as stated earlier, the contract should detail the specific report requirements, including report contents and report frequency. We envision three different report requirements based on organizational level—strategic, regional and base level. At the strategic level, we envision AMC as the central project office, with responsibility as the overall program manager. Carrier reports to AMC should be provided monthly and should include a one line summary of their performance that month. Specifically, this report should include: total number of shipments and their on-time delivery rate (i.e., on-time delivery rate for XXXXX carrier for international movement was 98% for March 199X). A copy of this report would also be sent to Air Staff. A similar but separate report could be provided covering all CONUS shipments.

At the regional level, each MAJCOM should receive a summary report from each carrier with shipping data categorized by destination region/country. This report would provide MAJCOMs with visibility over the service provided to support their international missions. A copy of this report would also be sent to Air Staff and AMC. Finally, at the base-level, each Traffic Management Office (TMO) would receive a detailed summary of the carrier's performance, including information on all items shipped internationally from that particular TMO during the previous month. Reports should include information on pick-up and delivery dates/times, destination, the actual total transit time compared to the standard required by the contract, and a summary of on-time deliveries. Traffic managers should use the detailed reports to identify trends or potential problems. Frequent and frank communication with carriers could circumvent problems and ultimately improve carrier support in both the CONUS and international arenas.

Because concerns may arise involving the accuracy of carrier reporting, Traffic Management Officers would be required to validate a random sample of the data provided by the carrier. When validating the data, the TMO would select the number of required shipments at random and confirm delivery statistics available through electronic tracking mechanisms.

Recommendation 4: Reimbursement for Unsatisfactory Service

Another concept that could generate improved carrier support is the implementation of a reimbursement program for late deliveries. Carrier-generated reports discussed in Recommendation 3 could provide the data needed to recoup funds for late deliveries. By demanding reimbursement when carriers exhibit unsatisfactory performance, the Air Force could prevent carriers from profiting from poor performance, and encourage them

to perform within the contracted standards. This would signal to carriers that the Air Force is committed to excellence rather than mediocrity. When the carrier realizes it only makes money when it meets agreed upon conditions, it would work harder to meet established Air Force requirements.

The Air Force system lends itself to handling funds recoupment through crediting of accounts. After determining carrier liability, the carrier would be penalized at the contracted penalty rate (suggest 15 percent of the total shipment cost). The carrier would then credit the proper amount to the appropriate Air Force account. Each TMO would be required to review the reports provided by the carriers to follow through on documenting funds recoupment and forward the findings through their MAJCOM to AMC as the central project office.

Recommendation 5: Comprehensive Routing Guides

A routing guide is an effective way to provide corporate guidance on carrier selection for international express shipments. Simply stated, a routing guide takes into account all pertinent information on each carrier under contract with the company and identifies where the carrier's best performance lies. A routing guide can streamline the carrier selection process for the employees, thereby saving time and money by removing guesswork. A routing guide also provides consistency by ensuring all employees use the same corporate guidance. This enables the corporation to take advantage of the carrier's strengths and match them with the corporation's specific needs for the individual shipment in question. The routing guide simplifies the carrier selection process and is especially helpful when faced with multiple international carriers (Recommendation 1).

An Air Force routing guide should be centrally managed by AMC and published as required in order to maintain near real time accuracy. The guide would be a direct result of MAJCOM inputs via the Logistics Council (Recommendation 6). The routing guide would identify preferred carriers to a particular region/country, the level of service those carriers provide, specific customs requirements for the region (e.g., required documents, clearance requirements by country) and regional considerations (e.g., delivery considerations such as no delivery on Fridays or religious holidays, and special considerations, such as items prohibited in a specific country).

The routing guide could be distributed in several formats. The primary format would be an automated version incorporated into the Cargo Movement Operating System (CMOS). This, of course, would require program development by the Air Force Standard System Center (SSC). The development of an international decision matrix module would enable CMOS to select the "best" international carrier to meet Air Force requirements. A hard copy format would be a second option and would support shipping activities that do not have access to CMOS. This would ensure that the corporate guidance is available for use by all Air Force personnel. Other distribution venues should take advantage of emerging technologies on the Internet, such as e-mail and the Air Force's Lean Logistics World Wide Web site managed by Air Force Materiel Command.

Several areas should be considered before implementing the above initiative. First, from a legal standpoint, is it acceptable to publish a guide that tells Air Force personnel which carrier to select for express movement to a particular location? Second, to be effective the routing guide must be kept up to date and accurate; who will have the long term responsibility for updating the data records? These are but two of a vast number of

issues that fall outside the scope of our project, and should be explored further prior to implementation of this concept.

Recommendation 6: Development of Comprehensive Guidance by a Corporate Logistics Council

The development of corporate guidance is the one initiative that really helps pull the other innovations together into a comprehensive program. The best example of comprehensive corporate guidance was demonstrated by Motorola Corporation. Motorola's "Traffic Council" meets biannually to discuss carrier performance and feedback, contracts, and training issues—all aimed at improving corporate logistics. The benefits of this type of program filter throughout the organization. The Traffic Council generates program buy-in throughout the organization by encouraging participation from personnel at various levels and departments, and includes representatives from the various contracted commercial carriers. The Council serves as a mechanism that allows corporate logistics managers to disseminate "best practices" or changing logistics policy relatively quickly and efficiently, and to resolve existing problems and concerns using the knowledge and experience of council members. And, because commercial carriers are also invited to participate, a close interaction between customers and shippers inevitably develops—the key to improved customer satisfaction.

If the Air Force implemented this concept, many of the benefits seen in commercial industry would also be realized by the Air Force. Corporate logistics councils would provide Air Force logistics managers a way of exchanging vital information and resolving critical issues. Additionally, since contracted commercial carriers would be encouraged

to participate, interaction between the Air Force and the commercial contractors would undoubtedly improve, yielding better customer support across the board.

We suggest that logistics councils be conducted at two levels: those hosted by the MAJCOMs, and those sponsored by AMC and the Air Staff. The MAJCOM logistics councils would be held annually and include MAJCOM representatives and base level traffic managers. Council meetings could be hosted by a different base each year to facilitate communication between the MAJCOM and base level Traffic Management Officers (TMOs). As mentioned previously, international commercial carrier district representatives would also be invited to participate. Discussions should focus on, but not be limited to, carrier performance and feedback, contractual issues, successful new initiatives, areas of concern, training, clarification of new or changing logistics policies, and other topics as deemed appropriate by the MAJCOM staff. Issues requiring higher headquarters involvement for resolution would be submitted as agenda items for discussion at the Air Force Logistics Council meeting.

The Air Force Logistics Council would be sponsored and hosted by the Air Staff and AMC, and consist of representatives from the Air Staff, AMC, the ALCs, each of the MAJCOMs, a limited number of base level traffic managers selected by their MAJCOMs, and commercial carrier representatives. This council could also be held annually, following the MAJCOM logistics council meetings. The Air Force Logistics Council would function much like a MAJCOM council, with a similar charter, but at the higher level of authority. Having this centralized point for carrier concerns and feedback, as well as a focal point for carrier performance and contractual issues, would result in more effective interaction between the commercial carriers and the organizations they support,

and the Air Force as a whole. Information from the Air Force Logistics Council could be disseminated to all Air Force agencies via the routing guide, published minutes, and verbally by council representatives, thus ensuring standardization throughout the organization.

Recommendation 7: Requirement for Further Research

This research project identified several initiatives that could benefit the Air Force if implemented. Due to research limitations, this project has "barely skimmed the surface" of several of the issues noted. If these concepts are adopted by Air Force senior leaders, further exploration and experimentation would be required.

Conceptually, these initiatives do not have to be limited to the Air Force. They have applicability throughout the DOD. Each Service can implement these recommendations within the confines of their particular supply and maintenance procedures. Developing DOD-level contracts and a DOD logistics council would increase inter-service cooperation and cost efficiency as a result of the higher volume of packages. The higher the volume of packages, the better the bargaining clout in negotiating contracts. This would mean lower costs, better communication and potentially improved working relationships across the DOD.

Conclusion

Lean Logistics and Two-Level Maintenance are concepts that we expect will be with us well into the future. These new philosophies in logistics management depend on the availability of responsive transportation to meet customer needs and, as a result, there is a push towards more extensive use of international commercial express carriers. Current

Air Force transportation procedures for international movement of high priority small package shipments should be amended to improve the quality and timeliness of the transportation support required by current logistics practices.

Through benchmarking, we identified "best practices" within commercial industry regarding the selection of transportation carriers. Several recommendations surfaced, including the need for detailed contracts with multiple international commercial carriers, detailed carrier-generated reports, reimbursement for unsatisfactory service, development of comprehensive routing guides, and the development of corporate guidance through a corporate logistics council. As we head into the 21st century and the demand for efficient and effective logistics support dramatically increases, these initiatives should be explored further for possible implementation within the Air Force transportation system, and for even broader use within the Department of Defense.

Appendix A

Companies Contacted

Malcolm Baldrige National Quality Award Recipients

1. Eastman Chemical Company (Eastman Kodak)—1993 Recipient Number of Employees: 17,750; 7,000 customers worldwide
2. Transmission Systems Business Unit (Division of AT&T)—1992 Recipient Number of Employees: 10,500; 3,000 at 5 European sites
3. Cadillac—1990 Recipient Number of Employees: 10,000
4. Business Products and Systems (BP & S)(Xerox)—1989 Recipient Number of Employees: 50,000
5. Milliken & Company—1989 Recipient Number of Employees: 14,000
6. Motorola—1988 Recipient Number of Employees: 99,000
7. IBM Rochester—1990 Recipient Number of Employees: 8,100
8. Solectron Corportation—1991 Recipient Number of Employees: 3,000
9. Westinghouse Commercial Nuclear Fuel Division—1988 Recipient Number of Employees: 2,000
10. Zytec—1991 Recipient Number of Employees: 748

Appendix B

Inquiry

TELEPHONE INQUIRY SELECTION AND EVALUATION OF TRANSPORTATION CARRIERS

This inquiry was developed by Army and Air Force officers attending Air Command and Staff College, Maxwell AFB, AL. Our research project focuses on improving the Air Force's ability to transport high priority small package shipments to locations worldwide. Your responses are a part of our proposal to benchmark "best practices" from commercial industry in an effort to improve the Air Force's ability to meet their customers' needs.

A. GENERAL INFORMATION

1. Do you ship high priority small packages (less than 150 lbs) to international locations?

2. Do you use express transportation services for these shipments?

3. How many high priority small package international shipments do you make per month?

B. CARRIER SELECTION

1. Do you use the same carrier for all shipments? If not, why?

2. Are you are in partnership with a carrier? (Exclusive use, contract, etc.) If so, what do you see as the advantages/disadvantages of the partnership?

3. How do you select your carrier(s)? Please rank order your top five (5) criteria by importance, with "1" choice being the most important.

_____ Carrier Liability	*Customer Service*	*Reliability*
_____ Claims Process	_____ Speed of Response	_____ Pickup
_____ Cost	to Inquiry	_____ Delivery
_____ Frequency of Service	_____ Accuracy of Response	_____ Total Transit
_____ Oversight/Tracking	to Inquiry	Time
_____ Range of Destinations	_____ Courtesy and Politeness	

4. How do you handle international customs (i.e., Carrier responsibility, your company's responsibility)?

5. Does your company or the carrier prepare entry documents, such as commercial invoices? Do you use harmonized system codes to identify the commodity being shipped?

C. CARRIER EVALUATION

1. How do you evaluate carrier performance?

2. How is this evaluation used in future carrier selections?

3. Do you recover freight charges if the carrier does not meet the agreed upon delivery time? If so, how?

D. OTHER COMMENTS

If you have any questions, please do not hesitate to contact one of the following individuals:

Major Linda Dahl	(334)953-2695
Major Billie Jean Antes	(334)953-2168
Major Darcy Lilley	(334)953-2176
Major Thomas Keith	(334)953-5676

THANK YOU FOR YOUR PARTICIPATION

Appendix C

Script

SCRIPT TO BE USED DURING THE INITIAL TELEPHONE CONTACT WITH COMMERCIAL INDUSTRY TO BE SURVEYED

1. Hello. My name is _____. I am an Air Force/Army Transportation Officer attending the Air Command and Staff College at Maxwell Air Force Base, Alabama. I am part of a group that is conducting research regarding the transportation of small packages internationally. Could you direct me to the individual who would be able to authorize your company's participation in this research project?

(If this is the person who can authorize participation, skip to #3 below)

(If forwarded to another individual)
2. Hello. My name is _____ . I am an Air Force/Army officer attending Air Command and Staff College at Maxwell Air Force Base, Alabama.

3. I am part of a group that is working on a research project to benchmark how leading corporations within commercial industry select carriers for shipment of their high priority freight internationally. We hope to use this project to improve the Air Force's efficiency in moving this type of cargo worldwide. We are conducting a brief telephone survey and we selected your company as a possible participant because you were a Malcolm Baldrige National Quality Award winner. Congratulations on this tremendous accomplishment.

4. This inquiry takes approximately ___ minutes to complete. Would your company be interested in participating in this survey?

5. Will you be our point of contact? Is this a good phone number for you?

(If it is the individual you are talking to, proceed to #7. If it is not the person you are talking to, get a POC, title, and phone number, and proceed to #6.)

6. Hello. My name is _____ . I am an Air Force/Army officer attending Air Command and Staff College at Maxwell Air Force Base, Alabama. I am part of a group that is working on a research project to benchmark how leading corporations within commercial industry select carriers for shipment of their high priority freight internationally. We hope to use this project to improve the Air Force's efficiency in moving this type of cargo worldwide. We are conducting a brief telephone survey and we selected your company as a participant because you were a Malcolm Baldrige National Quality Award winner. I was given your name as a point of contact by ___(Name) _____, ____(Dept)_____, who authorized your company's participation in our telephone survey.

7. I would like to fax the inquiry to you for your review prior to discussing it with you over the telephone. What is your fax number?

8. What would be a convenient time for me to call you to discuss your responses to the inquiry?

9. If you have any questions, please feel free to give me a call at (334)953-XXXX and I want to thank you for agreeing to assist us in our research. We certainly appreciate your support and I look forward to talking with you again on _____.
(Date/Time)

Appendix D

Cover Letter

FROM:

TO:

SUBJ: Inquiry—Selection and Evaluation of Transportation Carriers

Thank you for your participation in our inquiry. Your inputs are extremely important to us and will play a vital role in our efforts to improve the efficiency of the Air Force transportation system.

Our research focuses on improving the way we handle high priority small package international shipments. This project is being driven, in part, by two Department of Defense goals that will help us meet the challenges of the Post Cold War era. First, we are dedicated to reducing logistics response times, focusing on the need for better, faster more precise and highly mobile response capability and a leaner structure that better balances public and private capabilities. Secondly, we must streamline our logistics infrastructure, with emphasis on providing efficient service to our customers by implementing successful commercial business practices. In this regard, we are counting on leading industries, like yours, to share their insight and innovations with us. Our goal in this project is to benchmark your most successful practices and adapt them for possible implementation within the Air Force.

The attached inquiry solicits information on the processes you go through to select and evaluate the carriers you use to transport your high priority small package shipments to locations around the world. It is divided into four sections. Each section is self-explanatory. Once you have had time to review the questions, I will contact you to discuss your responses. Your inputs are key to the success of this project and we greatly appreciate your support.

Once again, thank you for your time and assistance, and we look forward to working with you. If you have any questions or comments, please feel free to contact me at (XXX) XXX-XXXX.

1 Atch
Inquiry

Appendix E

Telephone Inquiries

TELEPHONE INQUIRY
with
Susan Skilnyk, International Logistics Export Traffic Dept.,
Logistics Analysis, Motorola

A. GENERAL INFORMATION

1. Do you ship high priority small packages (less than 150 lbs) to international locations?

Yes

2. Do you use express transportation services for these shipments?

Yes

3. How many high priority small package international shipments do you make per month?

Corporate wide, 100,000s each month. Personally, I handle 5-600 packages and 1000s of letter packs each month. Overall, Motorola ships over 1,000,000 express packages each year.

B. CARRIER SELECTION

1. Do you use the same carrier for all shipments? If not, why?

No, different carriers service different areas more effectively. We use the best carrier for the area we're shipping to. This is based on corporate information and my experience/knowledge of who has the best delivery time, most destinations etc. Good business says "don't put all your eggs in one basket."

2. Are you are in partnership with a carrier? (Exclusive use, contract, etc.) If so, what do you see as the advantages/disadvantages of the partnership?

We don't exclusively use any one carrier but we do have very specific contracts with each of our carriers. These contracts lay out prices, movement agreements, customs clearance procedures, and penalties for missed deliveries. Operating without a contract leaves you wide open for problems. With a contract you tell the carrier what you what done and how. Without one, the carrier performs how he wants or how he thinks you want him to perform. Contracts give you and the carrier assurances. Plus carriers will work harder if they know they've got a long term agreement with you. We find that especially true 'cause we're moving millions of packages a year. The carriers want our business.

3. How do you select your carrier(s)? Please rank order your top five (5) criteria by importance, with "1" choice being the most important.

__4__ Carrier Liability *	*Customer Service*	*Reliability*	
_____ Claims Process	_____ Speed of Response	_____ Pickup	
__3__ Cost	to Inquiry	_____ Delivery	
_____ Frequency of Service	__5__ Accuracy of Response	__1__ Total Transit	
_____ Oversight/Tracking	to Inquiry	Time	
__2__ Range of Destinations	_____ Courtesy and politeness		

* Liability is very important to us. If we miss a delivery we're typically penalized financially by our customers. So we want to make sure the carrier is also liable to cover those costs

** All of these items are critical—make sure each is covered in contracts

4. How do you handle international customs (i.e., Carrier responsibility, your company's responsibility)?

Carrier does all the customs work.. Of course we do all the required invoices and commercial documents but we depend on the carriers to work the customs processes. We do a lot of "free domicile" work meaning that the shipper is responsible for all shipping, duty and customs costs

5. Does your company or the carrier prepare entry documents, such as commercial invoices? Do you use harmonized system codes to identify the commodity being shipped?

As I said, we prepare all the documentation.

C. CARRIER EVALUATION

1. How do you evaluate carrier performance?

Typically we get quarterly reports either in hard copy or EDI (carriers really like EDI) and we use them to compare services performed by the carriers. The report detail the number of shipments handled by different carriers, costs, transit times, etc. These reports are evaluated at all levels including Corporate and carry a lot of weight and visibility. I personally use them to identify trends, problems or successes.

2. How is this evaluation used in future carrier selections?

Most certainly it's used to help us select carriers. If a carrier isn't performing, we tell them to fix it or we stop using them. Internationally they may have problems getting into a particular area or region. Some carriers just have better networks than others in a particular area. If we run into major problems with a carrier, we try to resolve it but big issues may make it to the Traffic Council (more on this in the comments section)

3. Do you recover freight charges if the carrier does not meet the agreed upon delivery time? If so, how?

You bet we do! If we miss a delivery date, we are typically penalized by our customers—they depend on us. We are penalized because that's our contractural agreement with them and if we're late because of a carrier delay, we'll go after the carrier and task him to pay the penalty. This is very clearly stipulated in the contract. They miss a delivery they pay! We try to recover charges for missed all deliveries. Yes, it takes time but we think its worth the effort.

D. OTHER COMMENTS

1. We make hundred's of thousands of shipments corporation wide each month so we're talking big business here. We use lot's of carriers but for express movement we use FedEx, Burlington, DHL, and UPS.
2. We have a Traffic Council who's responsible for negotiating the contracts with the carriers—selecting the best carriers to service certain areas, best prices, best service, etc. This council is composed of a mixture of people who have expertise in shipping processes, they meet semi-annually and make recommendations/ decisions about who to use for what service. This council is basically a steering group who pushes for the best possible service to our customers. If you're going to start looking at contracts etc, make sure to includes legal folks too—contracts are always very complicated and you want to be sure everything is legal and above board. The big advantage of the council is the shared corporate knowledge. Everyone gets the advantage of everyone else's knowledge about things. Need complete involvement and information sharing to make all this work. Bottom line is to get the "best service for the best price" and let everyone know.
3. Motorola has an international division who is familiar with customs requirements for worldwide locations and decides what carriers can best meet customs requirements. In some cases if they're unsure about the area, they visit the countries, see what the requirements are.
4. Be sure to choose the best carriers to a given country or region. Motorola uses DHL in Middle East cause they've got the contacts in Saudi and have streamlined service. FedEx is our choice for Europe and Asian Pacific. We also do a lot of in-house training so our people understand the shipping requirements to certain regions because they vary so much by country/region. This is an on-going process as the requirements change constantly. As shippers we have to be aware of the requirements if not, there will likely be problems in the movement process.

TELEPHONE INQUIRY
with
Mr Dan Hedgepath, General Traffic Manager, Milliken and Co.
PO Box 4396
Spartanburg SC 29305

A. GENERAL INFORMATION

1. Do you ship high priority small packages (less than 150 lbs) to international locations?

Yes. We coordinate shipments for 56 different locations.

2. Do you use express transportation services for these shipments?

Yes

3. How many high priority small package international shipments do you make per month?

Approximately 400-600 per month. That's an educated guess but pretty accurate.

B. CARRIER SELECTION

1. Do you use the same carrier for all shipments? If not, why?

No. We use many different carriers in an attempt to get the best service for the best price. Experience has shown that some carriers just do a better job to certain destinations than others.

2. Are you are in partnership with a carrier? (Exclusive use, contract, etc.) If so, what do you see as the advantages/disadvantages of the partnership?

Not to the point of exclusive use of one particular carrier but we have agreements (contracts) with each carrier we use. These contracts are renewed annually and lay out prices, service requirements, and report requirements. Contracting activities are primarily my responsibility but I involve legal in all areas requiring their expertise. When the contracts are first negotiated I generally run the contract through legal so they can ensure everything is aligned to their specifications but on the annual reviews I involve legal on an "as needed" basis. This way the relationship builds between the carrier and Traffic, not with Legal—this is very beneficial.

The benefit of a contract is the long term relationships you can develop with a carrier. In my opinion, carriers do a better job if they know the contract is long standing. [I've found] attitudes change once the carrier knows the contract is going up for bid. In this business good communication equals good service and good prices. Additionally, we're all in business to make money and the contracts give you a price cut. The more volume you have the greater discount a carrier is likely to give you. They want your business.

3. How do you select your carrier(s)? Please rank order your top five (5) criteria by importance, with "1" choice being the most important.

_____ Carrier Liability ***	*Customer Service*	*Reliability*
_____ Claims Process ***	__5__ Speed of Response	_____ Pickup
__2__ Cost	to Inquiry	__3__ Delivery **
_____ Frequency of Service	_____ Accuracy of Response	__1__ Total Transit*
_____ Oversight/Tracking	to Inquiry	Time
__4__ Range of Destinations	_____ Courtesy and politeness	

* My #1 is total transportation cycle time
** We depend on their scheduled deliveries. If they say it'll be there at 1000, I expect it to be there
*** Insignificant because these are typically covered very clearly in the contracts

4. How do you handle international customs (i.e., Carrier responsibility, your company's responsibility)?

We prepare paperwork, the carrier works the process.

5. Does your company or the carrier prepare entry documents, such as commercial invoices? Do you use harmonized system codes to identify the commodity being shipped?

Again, we do the normal paperwork (invoices, etc.) the carrier does everything else and bills us for the charges

C. CARRIER EVALUATION

1. How do you evaluate carrier performance?

We require monthly reports from all our strategic carriers—couriers (small package express) and less than truck load lot carriers. These reports show shipment movement times, shipment by shipment and have a shipment summary that shows total on-time percentage. This (on-time percentage) is a very important number to me. I really only have two measures of the carrier efficiency: the on-time summary and verbal or written complaints. If I get "bad" measures in either area, it's a sign that something is wrong. We shot for 97-98 percent or higher in the on-time delivery percentage.

2. How is this evaluation used in future carrier selections?

I use the report to discuss trends with carriers. This way they know we're looking for. I've got the idea that "the squeaky wheel gets the grease," so to speak. I talk to the carriers if I see a problem and if the problem doesn't get fixed, we just use other carriers. They eventually get the idea.

3. Do you recover freight charges if the carrier does not meet the agreed upon delivery time? If so, how?

Non-conformance is very hard to pinpoint. Frankly, I don't have the people or the resources to spend to scrutinizing the carriers that much. Again, if a carrier consistently fails to meet requirements, we simply use a different carrier. They usually get the point.

D. OTHER COMMENTS

1. Mr Hedgepath coordinates shipments for Milliken's 56 domestic and international locations.
2. We ship everywhere, especially small packages. For small packages (courier) we mostly use FedEx and DHL, but use others if their service to an area is better. Not all companies can provide the same service at the same cost and I'm looking for the best service at the lowest cost. I "buy a carrier's strengths—buy value added services." The carriers have a "menu of services you can buy"—we buy what we need.
3. A big advantage for use is that they handle the customs clearance process. They have streamlined processes and we've found that the customs process for small packages is simplified relative to the large package process. We totally rely on the carrier systems to work the customs issues. They pay the customs fees up front and bill us after the fact.
4. Milliken does publish both an electronic and paper routing guide. This is a simple document that highlights carriers and regions/areas they service for Milliken and is designed to assist "non-experts" in carrier selection. Although Milliken's carrier selection processes for CONUS shipments are automated by their Company shipping system, International Express movements are handled manually. The market changes constantly and various carriers give better rates or service at different times, so we [Milliken] prefers that their shipping operations coordinate express international shipments with the corporate (Mr Hedgepath) Traffic Management Office. This is done primarily to ensure that the best service is purchased as well as to take advantage of consolidated shipment costs and carrier efficiencies.

TELEPHONE INQUIRY
with
Jackie Arias, Head of Corporate Shipping and Traffic Dept
Solectron Manufacturing Corporation

A. GENERAL INFORMATION

1. Do you ship high priority small packages (less than 150 lbs) to international locations?

Occasionally, however most of our shipping is within the U.S. We are a subcontracting manufacturer, manufacturing mother boards. Our outbound shipments are usually processed with the instructions of consignee.

2. Do you use express transportation services for these shipments?

Only if the customer requests. Inbound, if we need transistors, for example, we tell supplier to ship them FedEx.

3. How many high priority small package international shipments do you make per month?

We try to avoid this type of shipment, but probably less than 50.

B. CARRIER SELECTION

1. Do you use the same carrier for all shipments? If not, why?

No. Use 5 overseas facilities. If they request us to ship, they pay, so we use their carrier preferences. If we ship on our own we use contract carriers.

2. Are you are in partnership with a carrier? (Exclusive use, contract, etc.) If so, what do you see as the advantages/disadvantages of the partnership?

We use our company's routing guide which has preferred carrier and negotiated rates by region. If we need air services we use FedEx. If we have counter to counter (stateside), we go with other carriers. The advantage is that deliveries are on time; the shipper has commitment to us and we expect and see zero damages.

3. How do you handle international customs (i.e., Carrier responsibility, your company's responsibility)?

If we are the shipper of record, we take responsibility. If we are not the exporter, i.e., we are sending products for someone else (since we are an intermediate manufacturer), that company assumes responsibility, so customer is responsible.

4. How do you select your carrier(s)? Please rank order your top five (5) criteria by importance, with "1" choice being the most important.

__1__ Carrier Liability	*Customer Service*	*Reliability*
_____ Claims Process	_____ Speed of Response	__5__ Pickup
_____ Costto Inquiry	__3__ Delivery	
_____ Frequency of Service	__2__ Accuracy of Response	__4__ Total Transit
_____ Oversight/Tracking	to Inquiry	Time
_____ Range of Destinations	_____ Courtesy and Politeness	

5. Does your company or the carrier prepare entry documents, such as commercial invoices? Do you use harmonized system codes to identify the commodity being shipped?

We rely on customs house brokers. We prepare commercial invoice when we are the exporter of record. We do use harmonized system codes, and rely on export regulations.

C. CARRIER EVALUATION

1. How do you evaluate carrier performance?

On time delivery is most important evaluation point, followed closely by zero claims on our part.

2. How is this evaluation used in future carrier selections?

Each carrier in our routing guide has to provide on-time transit, inbound/outbound, and activity reports to us. We use these to develop a model to see if other carriers can meet or exceed
the standards that this carrier sets. So we are constantly evaluation for better, faster, cheaper, and safer transport options. Then we negotiate transport contracts based on these factors.

3. Do you recover freight charges if the carrier does not meet the agreed upon delivery time? If so, how?

Yes. Most of the time the carrier will credit Solectron's account rather than sending back refunds.

D. OTHER COMMENTS

We want a carrier to handle as many of our needs as possible, such as a company that can deliver to several different regions of the world. We use a customs house broker (*previously mentioned), but sometimes a freight forward is better because it can handle the custom clearances as part of the shipping process, rather than having the customs house prepare shipment customs forms independent of transporter.

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